JACC Vol. 10, No. 1
July 1987:230

LETTERS TO THE EDITOR

Exercise Testing and Survival After Coronary Bypass Surgery

The report by Weiner et al. (1) from the Coronary Artery Surgery Study (CASS) registry regarding the influence of medical and surgical therapy on survival based on exercise testing is potentially of significant value in clinical decision making.

In the report, a Cox model (Table 3) demonstrates nine clinical, exercise and angiographic variables in the overall study group that are significantly associated with survival. Final exercise stage (chi-square = 16.2) is the only important exercise variable, ranked seventh of nine based on the chi-square value. The variable with the strongest association to survival is left ventricular score (chi-square = 429.8). The authors identify a high risk group based on exercise response (ischemic ST response and completion of stage 1 or less of the Bruce protocol) in which survival is superior in certain surgical subgroups (data summarized in Fig. 4 to 6).

The authors carefully point out that the two treatment groups (medical and surgical) that constitute the entire study population differ substantially with respect to important baseline variables. They also point out that in analyzing survival in the various high risk exercise subgroups, adjustment is not made for differences among the subgroups with respect to the important predictors of survival identified by the Cox model.

We are concerned that without proper adjustment for important determinants of survival like left ventricular function, the exercise analysis as summarized in Figures 4 to 6 may not be valid. Other factors that characterize these individual subgroups may be just as important in influencing survival as the mode of therapy or the high risk exercise response. For example, in the data summarized in Figure 4, if the medically treated subgroup had a significantly greater number of patients with marked left ventricular dysfunction compared with the corresponding surgical subgroup, a survival disadvantage for the subgroup would be anticipated. Indeed, by combining data from Figures 4 and 6, it appears that 33% (111 of 334) of the medically treated patients with the high risk exercise response had a left ventricular score >10 whereas only 22% (102 of 455) of the corresponding surgical group had a score >10. Thus, left ventricular dysfunction may be the major factor accounting for the survival disadvantage of the medical subgroup in Figure 4. Similar baseline differences may be affecting the survival curves in Figures 5 and 6.

Of critical concern to the clinician is whether the functional response to exercise can help identify patients with three vessel disease and normal left ventricular function as well as patients with one or two vessel disease with abnormal left ventricular function whose survival may be enhanced by surgery. Unfortunately, these important subgroups are not directly analyzed. If one tries to glean an answer to this question from the data in Figures 5 and 6, conflicting answers are suggested depending on which curve is examined.

In summary, we do not believe it is valid to examine survival on the basis of exercise response without adjusting for other important survival predictors. In addition, certain key subgroups remain to be analyzed.

CHARLES TALIERCIO, MD, FACC
RAYMOND J. GIBBONS, MD, FACC
Department of Cardiology
Mayo Clinic
Rochester, Minnesota 55905

Reference

1. Weiner DA, Ryan TJ, McCabe CH, et al. The role of exercise testing in identifying patients with improved survival after coronary artery bypass surgery. J Am Coll Cardiol 1986;8:741–8.

Reply

The purpose of our initial investigation was to test the hypothesis that exercise testing is of value in identifying patients who would benefit from coronary artery bypass surgery with improved survival. Not only was a small subset of patients characterized with abnormal exercise test findings (the higher risk subgroup) whose survival was enhanced by surgery, but also, most importantly, a larger subset of patients was identified with different exercise test features (the lower risk subgroup) whose survival was not prolonged by surgery. We attempted to stratify patients by the two most important nonexercise test predictors of survival, the number of diseased coronary vessels and the left ventricular function but, as pointed out, we did not combine these two important angiographic descriptors to describe other subgroups. One must take into account the statistical limitations of retrospectively subgrouping patients and comparing multiple subsets. In addition, the numbers of patients in each subgroup are often too small to allow strict comparison. This latter problem precluded a meaningful comparison of the medical and surgical results in patients with one and two vessel coronary artery disease and abnormal left ventricular function.

We have begun a more extensive analysis of 1,249 patients with three vessel coronary artery disease stratified by both the left ventricular function and exercise test findings and have reported our preliminary observations (1). This subgroup of patients with three vessel coronary disease is an important subset because these patients are usually not candidates for coronary angioplasty. Moreover, the recent finding from the CASS randomized trial (2), that patients with three vessel coronary disease and impaired left ventricular function have a survival advantage after surgical therapy, has major economic implications regarding the indications for cardiac catheterization. In this investigation, however, the patients were not further stratified by the exercise test results. We hope to have meaningful results soon.

DONALD A. WEINER, MD, FACC
Section of Cardiology
University Hospital
75 East Newton Street
Boston, Massachusetts 02118

References

1. Weiner DA, Ryan TJ, McCabe CH, et al. Value of exercise testing in three vessel coronary disease (CASS Registry). Circulation 1985;72(III):III-463.
2. Passamani E, Davis KB, Gillespie MJ, et al. A randomized trial of coronary artery bypass surgery. Survival of patients with a low ejection fraction. N Engl J Med 1985;312:1665–71.